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(54) Connector fitting structure

(57) A fitting structure for connectors includes a female connector 30, a male connector 40 and a hood assembly 10. In assembling, an assembling port of the connector 30 is assembled to an opening 18 of the hood assembly 10. The engagement and disengagement between the male and female connectors 40, 30 can be accomplished by reciprocally moving slide members 13, 13 in the hood assembly 10 while guide pins 44 are being retained in guide grooves 14 of the slide members 13, 13. Respective interior dimensions A, B, D defining

the assembling port are respectively larger than respective interior dimensions a, b, d defining the opening 18 of the hood assembly 10, a step 38 is produced in a boundary area between the hood assembly 10 and the female connector 30. Without entering the female connector 30 into the hood assembly 10, it is possible to fit the male connector 40 to the female connector 30 certainly.

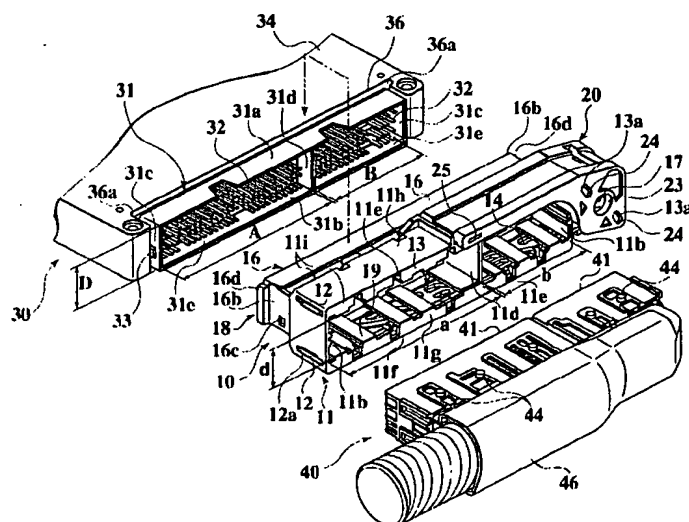


FIG.1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a connector fitting structure where multipolar male and female connectors are engaged with and disengaged from each other by sliding a slide member reciprocatively.

2. Description of the Related Art

[0002] Japanese Unexamined Patent Publication (kokai) No. 8-167635 discloses the conventional connector fitting structure where male and female connectors can be engaged with each other by sliding a slide member mounted on a hood assembly.

[0003] In the disclosed structure, the hood assembly is assembled to the female connector, provided with the slide member having a guide groove formed therein. In use, when sliding the slide member, then the male connector is drawn to engage with the female connector.

[0004] The female connector for engaging a plurality of terminals therein is provided with a hood for covering respective leading ends of the terminals. While, the hood assembly is provided with a flange to be engaged with the hood. By sliding the hood assembly to one direction while engaging the flange with the hood of the female connector, some engagement holes formed in the hood assembly can be engaged with engagement projections formed on the female connector, respectively. With this engagement, the hood assembly can be assembled to the female connector. During the sliding of the hood assembly, since some press plates formed on the hood of the female connector do press restricting parts of the hood assembly, which are disposed inside the flange of the hood assembly, the hood is interposed between each restricting part and the flange, thereby preventing the female connector and the hood assembly from rattling to each other.

[0005] In the above-mentioned conventional structure, however, there is a case that the hood of the female connector is positioned inside the hood assembly due to the rattling between the female connector and the hood assembly. In such a case, the leading end of the male connector being drawn into the hood assembly may butt against the hood in the hood assembly. Consequently, there is caused a problem that a manipulating force required for fitting the female and male connectors to each other is increased to cause the difficulty or impossibility of fitting.

SUMMARY OF THE INVENTION

[0006] It is therefore an object of the present invention to provide a connector fitting structure which allows the male and female connectors to be engaged with each

other certainly and also easily while surely preventing the female connector and the hood assembly from rattling to each other.

[0007] The object of the present invention described above can be accomplished by a fitting structure for connectors, comprising:

a female connector;
a male connector for engagement with the female connector;
a hood assembly having an opening to be assembled to an assembling port provided on either one of the male and female connectors, the hood assembly including at least one slide member adapted so as to slide therein and provided with one or more guide grooves; and
one or more guide pins formed on the other of the male and female connectors;
wherein respective interior dimensions defining the assembling port of the one of the male and female connectors are respectively larger than respective interior dimensions defining the opening of the hood assembly, thereby providing a step in a boundary area between the hood assembly and the one of the male and female connectors;
whereby the engagement and disengagement between the male and female connectors can be accomplished by reciprocatively moving the slide member while the one or more guide pins are retained in the one or more guide grooves.

[0008] In the above-mentioned structure, since the slide member does slide while the guide groove(s) of the slide member engages with the guide pin(s), the other of the male and female connectors is drawn into the one of the connectors through the hood assembly, so that both connectors can be engaged with each other.

[0009] According to the present invention, the hood assembly is assembled to one connector, for example, the female connector by assembling the opening of the hood assembly to the assembling port of the female connector. Regarding this assembling, since the interior dimensions defining the assembling port of the female connectors are respectively larger than respective interior dimensions defining the opening of the hood assembly, the step is produced in the boundary area between the hood assembly and the female connector. Thus, there is no possibility that the female connector is positioned inside the hood assembly, so that the other connector, for example, the male connector draw into the hood assembly does not butt against the female connector. Consequently, the male connector can be fitted to the female connector smooth and certainly.

[0010] In the above-mentioned fitting structure, preferably, the assembling port of the one of the male and female connectors is in the form of a frame, while the opening of the hood assembly is provided with a cover

for covering the frame of the one of the male and female connectors, the cover being opened on one side thereof, so that the hood assembly can be assembled to the one of the male and female connectors by sliding the frame relatively to the hood assembly through the opened side of the cover. In this way, since the assembling of the hood assembly to one connector, for example, the female connector can be attained by the sliding movement of either one of the hood assembly and the female connector in only one direction, the assembling operation can be simplified.

[0011] In the present invention, preferably, the hood assembly comprises a hood serving as a housing of the hood assembly and a manipulating lever pivotably mounted on the hood stopper, for sliding the slide member. In this case, owing to the provision of the manipulating lever, it will be possible to simplify the sliding operation of the slide member.

[0012] In the present invention, preferably, the guide groove consists of an inlet portion opening perpendicularly to one side of the slide member, a slanted portion slanted to a direction to slide the slide member and an end portion succeeding the slanted portion in parallel with the longitudinal direction of the slide member.

[0013] With the constitution of the guide groove, the sliding movement of the slide member can be converted to a force to drawing the other connector into the hood assembly.

[0014] In the present invention, preferably, the guide groove is provided, on one side of the inlet portion, with a flexible projection for temporary engagement with the guide pin.

[0015] In this case, owing to the provision of the flexible projection, it will be possible to engage the guide pin at the inlet portion of the guide groove, for the time being.

[0016] In the present invention, preferably, the frame is shaped to be rectangular and also provided, on both sidewalls thereof, with projections, while the cover of the hood assembly is provided, on both sidewalls thereof, with engagement holes for respective engagement with the projections on the frame.

[0017] With the above structure of the frame and the cover, it is possible to engage the frame with the cover securely.

[0018] In the present invention, preferably, the assembling port is constituted by at least one male-connector fitting chamber of which length and height correspond to the interior dimensions of the assembling port, while the opening of the hood assembly is constituted by at least one male-connector accommodating chamber of which length and height correspond to the interior dimensions of the opening.

[0019] With the above constitution of the assembling port and the cover, it will be possible to produce the above step in the boundary area between the hood assembly and the female connector.

[0020] In the present invention, preferably, the hood

assembly includes two slide members arranged on upper and lower sides of the hood and the manipulating lever is mounted on the hood in order to slide the slide members in opposite directions to each other.

[0021] In this case, owing to the provision of the plural slide members, it is possible to draw the other connector, for example, the male connector into the hood assembly certainly.

[0022] These and other objects and features of the present invention will become more fully apparent from the following description and appended claims taken in conjunction with the accompany drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is a perspective view of a connector fitting structure in accordance with an embodiment of the present invention;

Fig. 2A is an explanatory diagram of a slide member, viewed from the side of guide grooves;

Fig. 2B is an explanatory enlarged view of a part IIB of the slide member of Fig. 2A;

Fig. 3 is a cross sectional view showing a condition that a hood assembly is assembled to a female connector; and

Fig. 4 is an explanatory enlarged view of a part IV of Fig. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0024] Now referring to Fig. 1, the connector fitting structure of the embodiment comprises a female connector 30, a male connector 40 and a hood assembly 10, all of which are wholly made of synthetic resin. In assembly, the male connector 40 is drawn into the female connector 30 through the intermediary of the hood assembly 10.

[0025] The hood assembly 10 includes a hood 11 in the form of a rectangular cylinder, also serving as a female connector housing having a front opening 18 for fittingly fixing the female connector 30 and a rear part into which the male connector 40 is to be inserted, upper and lower slide grooves 12, 12 formed on the hood 11, a pair of slide members 13, 13 for sliding in the slide grooves 12, 12 reciprocally and a synthetic manipulating lever 20 allowing the respective slide members 13, 13 to reciprocally slide for engagement or disengagement of the multipolar female connector 30 with the multipolar male connector 40.

[0026] The interior of the hood 11 is divided into two "male-connector" accommodating chambers 11b, 11b through a partition wall 11d. Each slide groove 12 has a pair of step parts 12a, 12a formed to retain thin-walled portions of each slide member 13 on both sides thereof, respectively. Thus, the pair of slide members 13, 13 are adapted so as to reciprocally slide into the pair of

slide grooves 12, 12 in the mutual opposite directions.

[0027] The hood 11 has a bottom wall 11f formed to oppose a top wall 11h. On both sides of the bottom wall 11f, a pair of sidewalls 11g, 11g are formed to stand upright, integrally with the bottom wall 11f. Similarly, the bottom wall 11h has a pair of sidewalls 11i, 11i formed to stand upright on both sides of the wall 11h, integrally. The upper slide groove 12 is disposed between the sidewalls 11i and 11i, while the lower slide groove 12 is disposed between the sidewalls 11g and 11g. The respective ends of the opposing sidewalls 11g, 11g are connected to each other through a plurality of bridging ribs 19, ... 19. Similarly, the respective ends of the opposing sidewalls 11i, 11i are also connected to each other through a plurality of bridging ribs 19, ... 19. Each bridging rib 19 is arranged so as to extend perpendicularly to the sliding direction of each slide member 13. The bridging ribs 19, ... 19 are disposed apart from each other in the longitudinal direction of the sidewalls 11g, 11g, 11i, 11i.

[0028] In this way, since both sidewalls 11g, 11g, and 11i, 11i interposing the upper and lower slide grooves 12, 12 respectively are connected to each other by the bridging ribs 19, ..., 19, it is possible to prevent both sidewalls 11g, 11g, and 11i, 11i from curving or tumbling inward. Thus, owing to the provision of the bridging ribs 19, ..., 19, it is possible to exclude a possibility that both sidewalls 11g, 11g, and 11i, 11i tightly come into contact with or gnaw into the slide members 13, 13 in the slide grooves 12, 12.

[0029] On the rear (the male connector's) side of the hood 11, the sidewalls 11g, 11i are respectively provided with a plurality of notch guides 11e, ..., 11e. Each notch guide 11e is arranged in a position opposing to each of inlet portions 14a of a plurality of guide grooves 14 respectively formed in the upper and lower slide members 13, 13.

[0030] Again, each slide member 13 is provided, on a surface thereof opposing the other slide member 13, with the plural guide grooves 14 each inclining to a direction to insert each slide member 13 by a predetermined angle. As shown with solid lines and chain lines in Fig. 2A, the inclining direction of each guide groove 14 of the upper slide member 13 is opposite to the inclining direction of each guide groove 14 of the lower slide member 13. In addition, each guide groove 14 consists of the inlet portion 14a opening perpendicularly to one side of the slide member 13, a slanted portion 14b succeeding the inlet portion 14a and an end portion 14c succeeding the slanted portion 14b in parallel with the longitudinal direction of the slide member 13.

[0031] On one side of each inlet portion 14a through which a guide pin 44 mentioned later is to be inserted into the guide groove 14, a temporary engagement means 15 is provided for temporary engagement with the guide pin 44. As shown in Fig. 2B, the temporary engagement means 15 is constituted by a flexible projection 15a integrally projecting so as to be in parallel

with the inlet portion 14a and a pair of notches 15b, 15b on both sides of the flexible projection 15a.

[0032] The manipulating lever 20 serves to reciprocally slide the pair of slide members 13, 13 in the opposite directions to each other and has a pivot center hole 23 formed at a center of the base part of the lever 20. Inserted into the pivot center hole 23 is a support shaft 17 which extends from the hood 11 and through which the manipulating lever 20 is carried so as to rotate up and down, by the hood 11. In the vicinity of the support shaft 17, a pair of long holes 24, 24 are respectively formed so as to put the hole 23 therebetween. The upper and lower slide members 13, 13 are respectively provided with column-shaped attachment bosses 13a, 13a which are inserted into the long holes 24, 24 in the lever 20, respectively. With the engagement of the lever 20 with the upper and lower slide members 13, 13, they can be slid in the opposite directions to each other by pivoting the manipulating lever 20 up and down.

[0033] Further, the manipulating lever 20 is provided, on one sidewall close to a leading end of the lever 20, with a rectangular engagement hole 25 for engagement with a not-shown engagement protrusion integrally formed on the sidewall 11i of the top wall 11h of the hood 11.

[0034] As mentioned before, the hood 11 is provided, on a front side thereof, with the opening 18 which is assembled to the female connector 30. The opening 18 is communicated with the male-connector accommodating chambers 11b, 11b, being the same size as the chambers 11b, 11b. About the opening 18, an elongated U-shaped cover 16 is provided to have an upper face 16a and right and left side faces 16b, 16b, opening downward.

[0035] On both side faces 16b, 16b of the cover 16, engagement holes 16c are formed for respective engagement with projections 33 of the female connector 30. Additionally, the cover 16 is provided, on both side faces 16b, 16b, with respective guide ribs 16d, 16d which operate to guide the hood assembly 10 when assembling it to the female connector 30. Note, the assembling of the hood assembly 10 to the female connector 30 can be accomplished by inserting a frame part 31 of the connector 30 through the above-mentioned opening underside of the cover 16 as shown with arrow of Fig. 1.

[0036] In the female connector 30, the frame part 31 engages with and carries a large number of pin-terminals 32 soldered to a printed wiring baseplate (not shown). The frame part 31 operates as an assembling entrance to which the cover 16 of the hood 11 is assembled. The frame part 31 is shaped in the form of a rectangular frame consisting of top and bottom walls 31a, 31b and both of left and right sidewalls 31c, 31c.

[0037] Owing to the provision of a partition wall 31d opposing the partition wall 11d of the hood 11, the interior of the frame 31 is divided into a pair of "male-connector" fitting chambers 31e, 31e for respective

engagement with two connector housings 41, 41 of the male connector 40. Furthermore, on respective exterior faces of the left and right sidewalls 31c, 31c of the frame 31, the above-mentioned projections 33, 33 are formed to engage in the engagement holes 16c, 16c of the hood 11, respectively.

[0038] The frame 31 is arranged on the rear side of a casing 34 fixed on the printed wiring baseplate through fixings (not shown). Defined between the rear side of the casing 34 and the frame 31 is a clearance 36 which is longer than the frame 31. Both ends of the clearance 36 in the longitudinal direction constitute guide recesses 36a, 36a for guiding the guide ribs 16d, 16d of the hood 11, respectively.

[0039] As to the dimensions of the frame 31 (i.e. an assembling port) of the female connector 30 and the opening 18 (i.e. the male-connector accommodating chamber 11b) of the hood 11, respective dimensions of the interior of the frame 31 are established larger than respective dimensions of the interior of the opening 18, respectively. In detail, providing that the length of the "male-connector" fitting chambers 31e, 31e of the frame 31 are respectively represented by the alphabets A, B and the height of each chamber 31e is represented by the alphabet D, while the length of the "male-connector" accommodating chambers 11b, 11b of the opening 18 are respectively represented by the alphabets a, b and the height of each chamber 11b is represented by the alphabet d, there are established the following relationships of:

$$A > a, B > b \text{ and } D > d$$

[0040] With the above dimensional relationships of the interiors, when the hood assembly 10 is assembled to the female connector 30, as shown in Figs. 3 and 4, it is possible to produce a step 38 in a boundary area between the opening 18 and the frame 31, corresponding to a difference in dimension (height) therebetween.

[0041] Again, the male connector 40 is provided with the pair of connector housings 41, 41 which are respectively inserted into the male-connector accommodating chambers 11b, 11b separated from each other by the partition wall 11d of the hood 11. These connector housings 41, 41 are to be inserted into the hood 11 from a direction perpendicular to the movement direction of the slide members 13, 13. Note, engaged and carried in the interior of each connector housing 41 are a plurality of terminals (not shown) into which the pin-terminals 32 of the female connector 30 are to be inserted in order to attain the electrical connection between the female connector 30 and the male connector 40.

[0042] On both upper and lower faces of the connector housing 41, the plural guide pins 44 are formed to respectively match the notch guides 11e and movably engage in the guide grooves 14 of the slide members 13. Note, a plurality of wires are connected to the terminals in the connector housing 41 and withdrawn out of

the housing 41 in the form of a bundle since they are covered with a cover 46.

[0043] According to the shown embodiment, as shown with the arrow with no reference numeral or alphabet of Fig. 1, the hood assembly 10 can be assembled to the female connector 30 by overlaying the front cover 16 of the hood assembly 10 on the rear frame 31 of the female connector 30 from its upside. Then, with the movement of the guide ribs 16d, 16d on both sides of the cover 16 in the guide recesses 16d, 16d of the hood assembly 10, the hood assembly 10 can be lowered without producing any positional deviation between the rear frame 31 and the cover 16 in plan view. With the hood's lowering, the projections 33 of the frame 31 engage in the engagement holes 16c of the cover 16, so that the opening 18 of the hood assembly 10 is assembled and fixed to the assembling port of the female connector 30, that is, the frame 31.

[0044] In the so-assembled condition, since the interior dimensions of the frame 31 of the female connector 30 are larger than the interior dimensions of the cover 16 of the hood assembly 10, the step 38 is formed at the boundary between the walls 31a, 31b and the sidewalls 31c, 31c of the female connector 30 and the opening 18 of the hood assembly 10, so that the respective walls 31a, 31b, 31c, 31c come into contact with the end face of the hood 11. Thus, there is no possibility that the walls 31a, 31b, 31c, 31c enter into the opening 18 of the hood assembly 10.

[0045] Consequently, since the male connector 40 drawn into the male-connector accommodating chamber 11b of the hood assembly 10 does not butt against the walls 31a, 31b, 31c, 31c of the female connector 30, there can be eliminated a possibility of increasing the manipulation force required in fitting the male connector 40 to the female connector 30, while the male connector 40 can be fitted to the female connector 30 certainly. In addition, even if the hood 11 is curved inwardly, the step 38 could absorb such an inward curve, thereby allowing the male connector 40 to be withdrawn into the hood 11.

[0046] After assembling the female connector 30 to the hood assembly 10, the male connector 40 is inserted into the hood 11 from the opposite side to the female connector 30, so that the guide pins 44 of the male connector 40 enter into the inlet portions 14a of the guide grooves 14 of the slide members 13, 13 through the notch guides 11e of the hood 11. Under this condition, when rotating the manipulating lever 20 to the downside, the slide members 13, 13 are slid in the upper and lower slide grooves 12, 12 of the hood 11 in the reciprocating direction. With the movements of the slide members 13, each guide pin 44 moves from the inlet portion 14a to the end portion 14c through the slanted portion 14b, so that the male connector 40 is drawn into the hood 11 for the mutual engagement of the connectors 30, 40.

[0047] The engagement between the multipolar female connector 30 and the multipolar male connector

40 can be certainly locked since the projection on the hood 11 is engaged in the engagement hole 25 in the sidewall 22 of the manipulating lever 20 at the time of the completion of rotating the manipulating lever 20 downward.

[0048] On the contrary, when rotating the manipulating lever 20 upward, the respective slide members 13, 13 slide in the upper and lower slide grooves 12 in the hood 11 in the mutual reciprocating directions. With the slide movements of the slide members 13, 13, each guide pin 44 moves from the end portion 14c to the inlet portion 14a through the slanted portion 14b, so that the male connector 40 is separated from the hood 11 for the disengagement of the connectors 30, 40.

[0049] In the above-mentioned ways, the engagement and disengagement between the female connector 30 and the female connector 40 can be accomplished.

[0050] Finally, it will be understood by those skilled in the art that the foregoing description is related to one preferred embodiment of the disclosed fitting structure for connectors, and that various changes and modifications may be made to the present invention without departing from the spirit and scope thereof.

[0051] For example, in one modification of the embodiment, the male connector 40 may have the above-mentioned frame 31, while the hood assembly 10 has the opening 18 to be assembled to the frame 31. In such a case, one or more guide pins would be provided on the female connector 30.

[0052] Additionally, two slide members 13, 13 of the hood assembly 10 may be replaced with a single slide member in the modification. Similarly, the slide member 13 may be provided with a single guide groove corresponding to a single guide pin formed on the male connector 40.

Claims

1. A fitting structure for connectors, comprising:

a female connector;
a male connector for engagement with the female connector;
a hood assembly having an opening to be assembled to an assembling port provided on either one of the male and female connectors, the hood assembly including at least one slide member adapted so as to slide therein and provided with one or more guide grooves; and
one or more guide pins formed on the other connector of the male and female connectors; wherein respective interior dimensions defining the assembling port of the one of the male and female connectors are respectively larger than respective interior dimensions defining the opening of the hood assembly, thereby providing a step in a boundary area between the hood assembly and the one of the male and

female connectors;

whereby the engagement and disengagement between the male and female connectors can be accomplished by reciprocatively moving the slide member while the one or more guide pins are retained in the one or more guide grooves.

2. A fitting structure as claimed in Claim 1, wherein the assembling port of the one of the male and female connectors is in the form of a frame, while the opening of the hood assembly is provided with a cover for covering the frame of the one of the male and female connectors, the cover being opened on one side thereof, whereby the hood assembly can be assembled to the one of the male and female connectors by sliding the frame relatively to the hood assembly through the opened side of the cover.
3. A fitting structure as claimed in Claim 2, wherein the hood assembly comprises a hood serving as a housing of the hood assembly and a manipulating lever pivotably mounted on the hood, for sliding the slide member.
4. A fitting structure as claimed in Claim 3, wherein the guide groove comprises an inlet portion opening perpendicularly to one side of the slide member, a slanted portion slanted to a direction to slide the slide member and an end portion succeeding the slanted portion, in parallel with the longitudinal direction of the slide member.
5. A fitting structure as claimed in Claim 4, wherein the guide groove is provided, on one side of the inlet portion, with a flexible projection for temporary engagement with the guide pin.
6. A fitting structure as claimed in Claim 5, wherein the frame is shaped to be rectangular and also provided, on both sidewalls thereof, with projections, while the cover of the hood assembly is provided, on both sidewalls thereof, with engagement holes for respective engagement with the projections on the frame.
7. A fitting structure as claimed in Claim 6, wherein the assembling port is constituted by at least one male-connector fitting chamber of which length and height correspond to the interior dimensions of the assembling port, while the opening of the hood assembly is constituted by at least one male-connector accommodating chamber of which length and height correspond to the interior dimensions of the opening.
8. A fitting structure as claimed in Claim 7, wherein the hood assembly includes two slide members

arranged on upper and lower sides of the hood and the manipulating lever is mounted on the hood in order to slide the slide members in opposite directions to each other.

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FIG.1

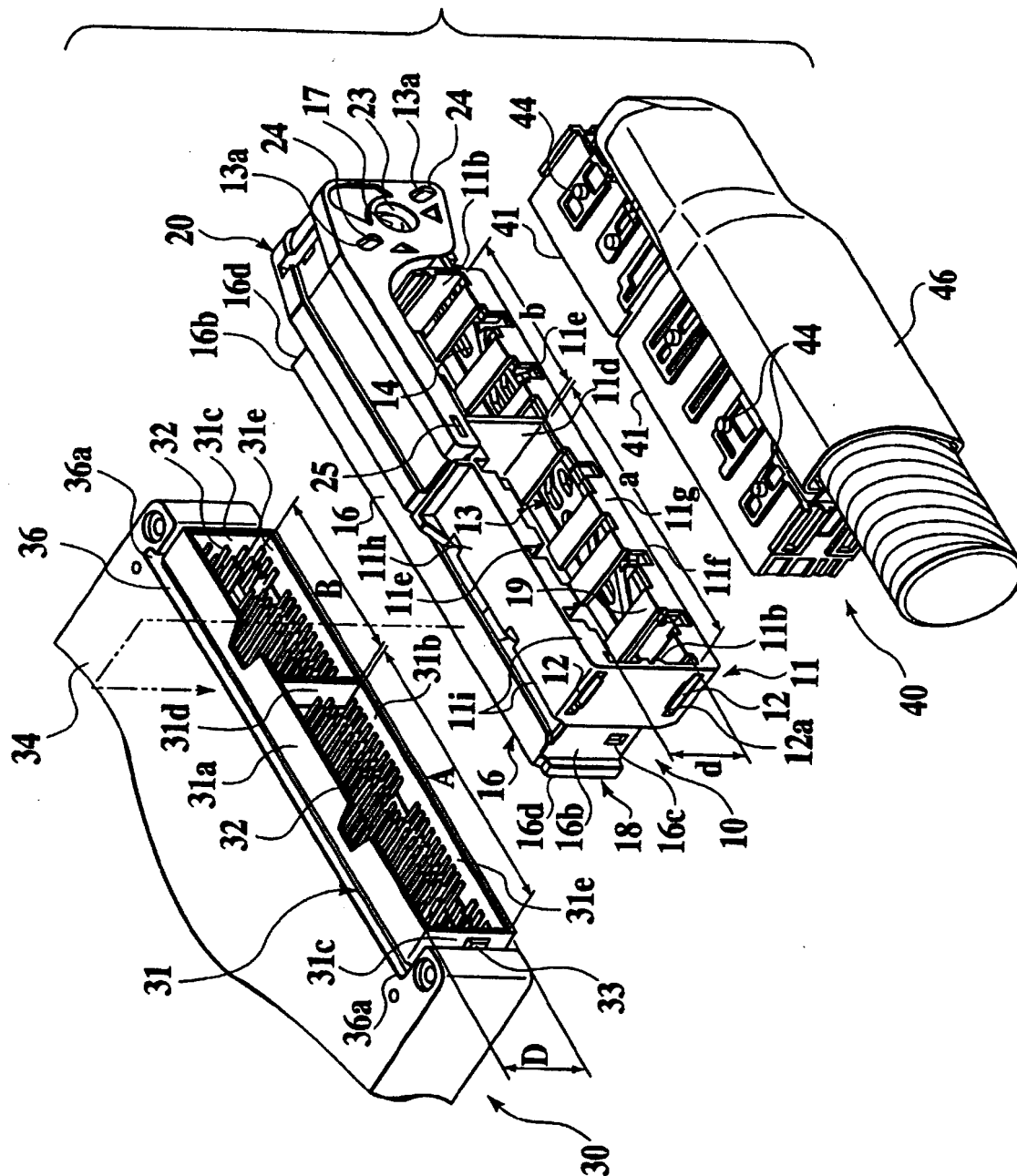


FIG.2A

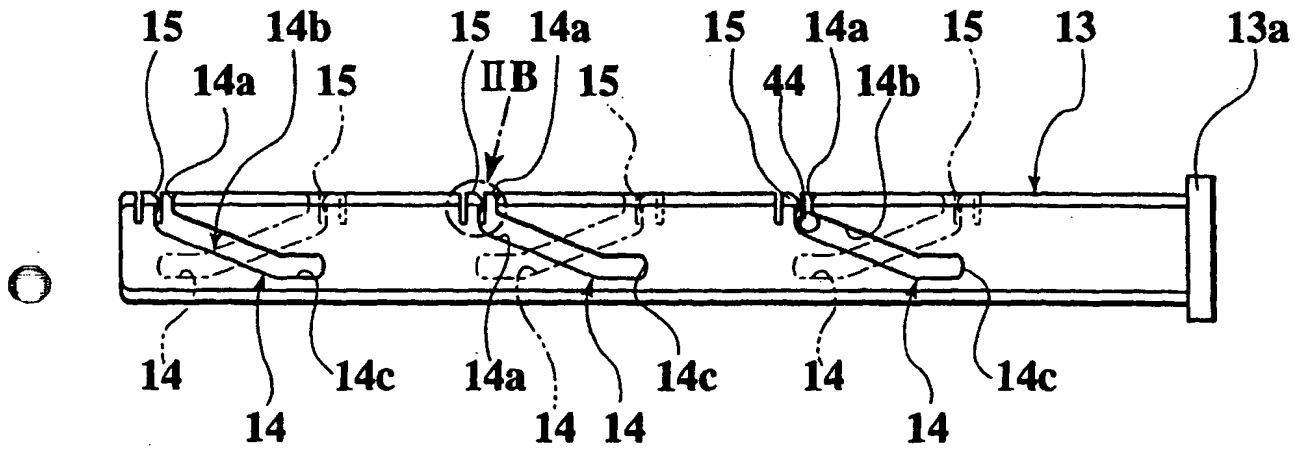


FIG.2B

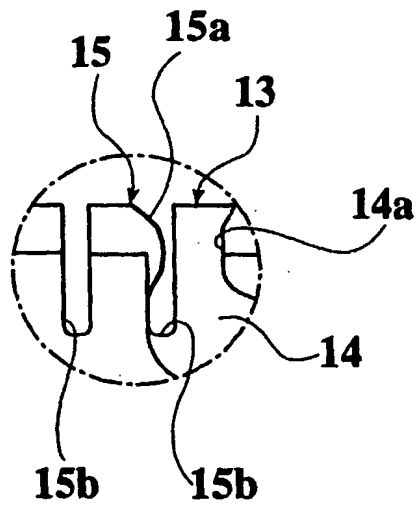


FIG.3

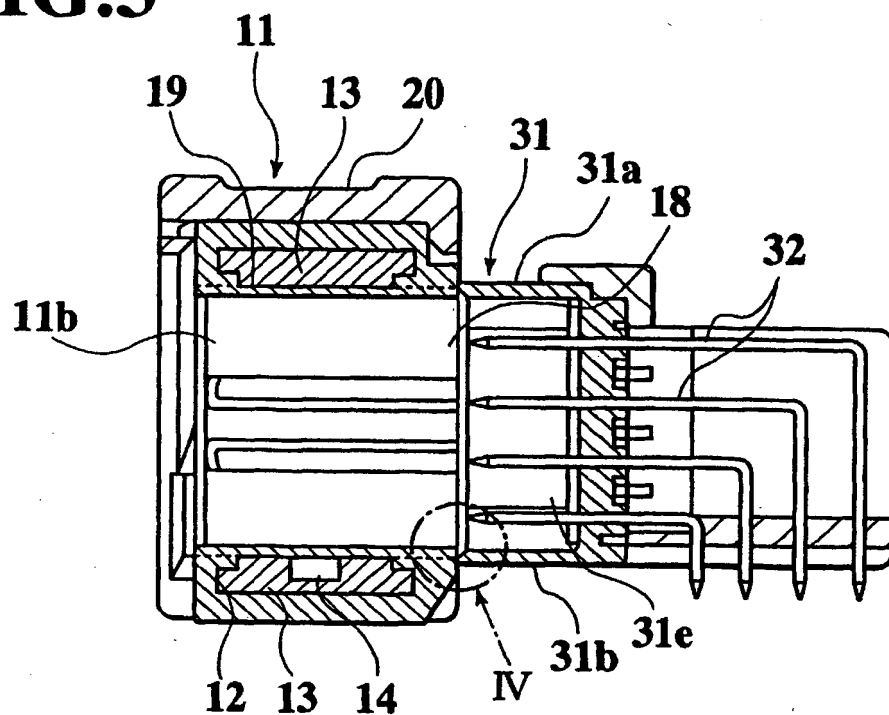
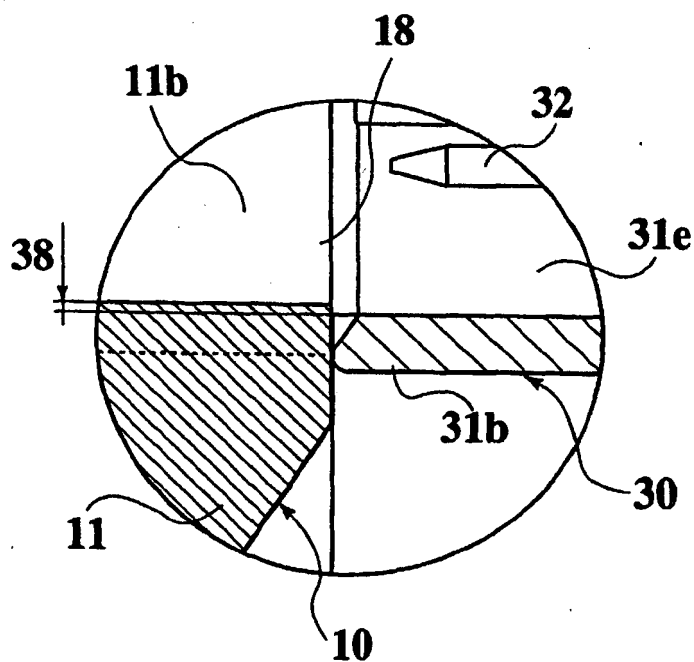
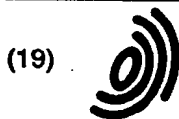


FIG.4





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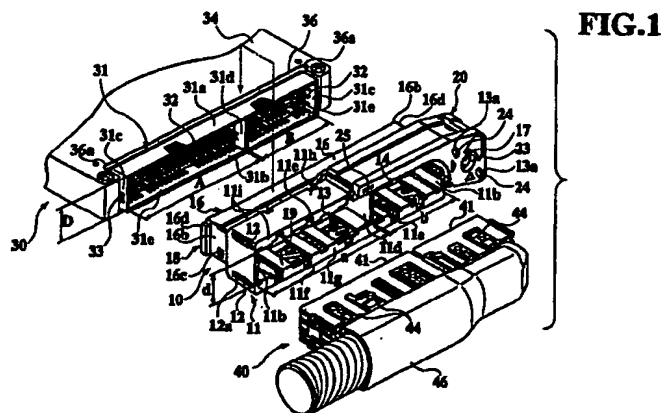
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the assembling port are respectively larger than respective interior dimensions a, b, d defining the opening 18 of the hood assembly 10, a step 38 is produced in a boundary area between the hood assembly 10 and the female connector 30. Without entering the female connector 30 into the hood assembly 10, it is possible to fit the male connector 40 to the female connector 30 certainly.





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EUROPEAN SEARCH REPORT

Application Number
EP 99 10 5096

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
E	EP 0 940 885 A (YAZAKI CORP) 8 September 1999 (1999-09-08) * claims; figures *	1-4	H01R13/629
E	EP 0 940 886 A (YAZAKI CORP) 8 September 1999 (1999-09-08) * claims; figures *	1	
A	EP 0 722 203 A (MOLEX INC) 17 July 1996 (1996-07-17) * claims; figures *	1	
A	EP 0 736 935 A (SUMITOMO WIRING SYSTEMS) 9 October 1996 (1996-10-09) * claims; figures *	1	
A	EP 0 825 684 A (YAZAKI CORP) 25 February 1998 (1998-02-25) * claims; figures *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01R
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 5 July 2000	Examiner Pfahler, R
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